$$\vec{\mathbf{F}} = k\frac{qq}{r^2}\hat{\mathbf{r}} \qquad \oint_{\text{surface}} \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{q_{\text{in}}}{\epsilon_o} \qquad \vec{\mathbf{E}} = k\frac{q}{r^2}\hat{\mathbf{r}}$$

$$\Phi_E = \int_{\text{surface}} \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} \qquad \vec{\mathbf{F}} = q\vec{\mathbf{E}} \qquad \vec{\mathbf{E}} = k\int \frac{dq}{r^2}\hat{\mathbf{r}}$$

$$dq = \lambda\, dl \qquad dq = \sigma\, dA \qquad dq = \rho\, dV \qquad \mu_0 = 4\pi \times 10^{-7}\frac{\mathrm{T\cdot m}}{\mathrm{A}}$$

$$k = 8.987\times 10^9\,\frac{\mathrm{N\cdot m^2}}{\mathrm{C^2}} \qquad \epsilon_o = 8.854\times 10^{-12}\,\frac{\mathrm{C^2}}{\mathrm{N\cdot m^2}} \qquad \text{elementary charge} = 1.602\times 10^{-19}\,\mathrm{C}$$

$$V = k\frac{q}{r} \qquad U = k\frac{q_1 q_2}{r_{12}} \qquad V = k\int \frac{dq}{r} \qquad \vec{\tau} = \vec{p} \times \vec{E} \qquad U = -\vec{p} \cdot \vec{E}$$

$$E_x = -\frac{\partial V}{\partial x} \qquad E_y = -\frac{\partial V}{\partial y} \qquad E_z = -\frac{\partial V}{\partial z}$$

$$C = \frac{Q}{\Delta V} \qquad U = \frac{1}{2}C(\Delta V)^2 \qquad R = \frac{\rho l}{A} \qquad R = \frac{\Delta V}{I} \qquad P = I\Delta V$$

$$R_{eq} = R_1 + R_2 + ... \qquad \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + ...$$

$$C_{eq} = C_1 + C_2 + ... \qquad \frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + ...$$

$$\vec{F} = q\vec{v} \times \vec{B} \qquad \vec{F} = I\vec{L} \times \vec{B} \qquad r = \frac{mv}{qB} \qquad \frac{F}{L} = \mu_0\frac{I_1 I_2}{2\pi a}$$

$$\vec{\tau} = \vec{\mu} \times \vec{B} \qquad U = -\vec{\mu} \cdot \vec{B} \qquad \vec{\mu} = NI\vec{A}$$

$$\Phi_B = \int \vec{B} \cdot d\vec{A} \qquad \mathcal{E} = -N\frac{d\Phi_B}{dt} \qquad L = \frac{N\Phi_B}{I} \qquad \frac{L}{I} = \mu_0 N^2 A$$

$$\mathcal{E}_L = -L\frac{dI}{dt} \qquad I = \frac{\mathcal{E}}{R}(1 - e^{\frac{-Rt}{L}}) \qquad B_{loop} = \frac{\mu_0 I}{2a} \qquad B_{wire} = \frac{\mu_0 I}{2\pi a}$$

$$B_{sol} = \mu_0\frac{N}{l}I$$